U. S. DEPARTMENT OF COMMERCE

Technical News Bulletin

of the

National Bureau of Standards

★ *Issued Monthly* ★

Washington July 1940[1] Number 279

CONTENTS

THIRTIETH NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

The Thirtieth National Conference on Weights and Measures met in Washington on June 4 to 7, inclusive. Four sessions were held at the Bureau and three at the Mayflower Hotel.

Two hundred and fifty-six members and guests from 25 States and the District of Columbia were registered, making up a truly representative group. The first session was opened with short addresses in memory of Fay S. Holbrook, secretary of the Conference for many years, who died last February.

In his opening address, Lyman J. Briggs, President of the Conference, called upon every weights and measures official to do all in his power to secure uniformity in laws and regulations throughout the country, so that weighing and measuring equipment which is acceptable in one jurisdiction will be equally acceptable in every other. He likened the present situation to the handicap under which the aircraft industry is laboring because of the demands of plane and engine manufacturers for a multiplicity of varieties of steel. "I believe thoroughly in individual initiative," said Dr. Briggs, "but in times of stress this is initiative gone wild."

Subjects of special importance considered by the Conference included: The consolidated standard container bill; Automatic indicating scales; Weights and measures schools; Vehicle scales; Measurement of liquefied petroleum gases; "Twisted strands" (Success through united effort); Corrections to standards; Testing, servicing, and repair of liquid-measuring devices; The Federal Food, Drug, and Cosmetic Act; Deceptive containers; and Dollar justice for the consumer. The interest shown by the conference in methods for measuring liquefied petroleum gases (a commodity, the sale of which is increasing rapidly) was ample evidence that weights and measures officials are on the alert to keep abreast of new developments. Methods of instructing the officers themselves, through question and answer schools and by other means, also received close attention.

Twenty-two formal papers were presented and discussed, in addition to reports from five committees and from

[1] Published with approval of the Director of the Budget.

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State delegates and the representatives of State associations of weights and measures officials.

At the closing session on June 7, the following officers were elected for the ensuing year: President, Lyman J. Briggs, Director of the National Bureau of Standards. Vice Presidents: H. N. Davis, Vermont; A. J. Jensen, North Dakota; Carl Klocker, Connecticut; J. G. Rogers, New Jersey; Louis G. Waldman, St. Louis, Mo.; Thomas Webb, Nashville, Tenn. Secretary: Ralph W. Smith, National Bureau of Standards. Treasurer: George F. Austin, Jr., Detroit, Mich.

FAULTY BALANCE ARRESTMENT

In an analytical balance recently submitted to the Bureau for test, it was noted that, when arrested, the stirrups were supported in a line noticeably below the surface of the agate plane, and therefore below the line in which the plane would be supported on the end knife-edge as the balance was released.

Although the arrestment arm was pivoted in line with the center knife-edge, this low position of the stirrup supports introduced an appreciable tendency to slide the agate plane across the knife-edge whenever the arrestment was lowered with enough overload on one pan to hold the stirrup in contact with the arrestment.

This injurious effect of the condition noted makes it advisable for manufacturers to watch the individual balances they turn out for proper alignment of stirrup planes and the contact points or edges, unless the type of arrestment is such that the stirrup arrestments cannot touch the stirrup except when the beam is held in its arrested position.

Whenever this tendency to slide the plane on the knife-edge exists, users of such balances should note that the harm can be reduced very greatly by not allowing the beam to tip more than a very short distance while a stirrup is in contact with the arrestment arm.

CORROSION OF AIRCRAFT METALS

Investigations of the corrosion of aircraft metals have been in progress continuously at the Bureau since 1925. Approximately 25,000 specimens of aluminum alloys, magnesium alloys, and stainless steels (60 alloys in all) have been corroded by means of accelerated laboratory tests or by exposure to the weather or to sea water. The exposure localities were Washington, D. C., Hampton Roads, Va., and Coco Solo, Canal Zone. Corrosion was determined by means of loss in tensile properties, or was measured directly on cross sections examined with the microscope at high magnification.

Corrosion in aluminum alloys occurred as either the "pitting" or intercrystalline types. As shown in RP1316, by Willard Mutchler, in the July Journal of Research, intercrystalline corrosion was responsible for serious embrittlement in duralumin-type alloys. Methods of heat treatment were evolved that eliminate intercrystalline attack. The work indicated that pitting could be minimized by preparing alloys from high-purity components, and by keeping the copper and iron contents low. Binary magnesium-aluminum alloys were found to become more susceptible to corrosion as the aluminum content increased. Small additions of zinc or tin rendered these alloys more resistant to attack. Stainless steels of the 18 chromium–8 nickel type containing small additions of molybdenum were more corrosion resistant than similar alloys without addition elements, or those with small additions of titanium or columbium.

Suitable surface coatings were developed, for both aluminum and magnesium alloys, to markedly improve their resistance to corrosion under severe saline conditions. The effect on corrosion produced by joining by means of rivets or by gas welds, seam welds, and spot welds was determined. Important data were also obtained on the potential effects involved when alloys of different chemical compositions were exposed in contact with each other.

SECOND SPECTRUM OF VANADIUM

Although discovered in 1831, by the Swedish chemist, Nils Gabriel Sefström, vanadium was not produced in a pure metallic state until nearly a century later. In 1932 the Vanadium Corporation of America supplied the Bureau with small ingots of pure vanadium metal for use as electrodes in spectrographic investigations. Four years later the Bureau published an extensive description and analysis of the spectrum emitted by neutral vanadium atoms. Now, in the July number of the Journal of Research (RP1317), William F. Meggers, chief of the Bureau's Spectroscopy Section, and Charlotte E. Moore, of Princeton University Observatory, present a new description of the spectrum emitted by singly ionized vana-

dium atoms, together with compilation and analysis of all available data. The second spectrum of vanadium is characterized by 1,700 lines from red to extreme ultraviolet, and 1,456 of these are now explained as transitions between 89 identified atomic-energy states. These facts are useful in the spectrochemical analysis of iron alloys containing vanadium. The presence of small amounts of vanadium profoundly alters the properties of steel, greatly increasing its toughness, elasticity, and tensile strength. Thus the metal named for the ancient Swedish goddess of beauty, Vanadis, has come to play an important utilitarian rôle in the construction of locomotive frames, driving axles, turbine and generator shafts, and large gun barrels.

COMPOSITION OF CATHODE FILMS

During electrodeposition, the concentration of metal in the bath is lower within 0.012 to 0.020 inch of the cathode than in the body of the solution. Thus the solution from which the metal is actually deposited has a composition which differs from that of the body of the bath. Although a knowledge of the composition and character of the cathode film would lead to a better understanding of cathodic processes, few attempts have been made to study it directly. However, Abner Brenner at the Bureau has developed a new method for studying cathode films in which the latter is isolated by freezing on the outside of a hollow cylinder. The refrigerant, which is poured into the hollow cathode, is cooled with solid carbon dioxide.

The cylinder with its coating of frozen solution is then put on a lathe and sucessive layers, 0.003 to 0.005 in. thick, are turned off and analyzed. This method permits a direct measurement of the thickness of the cathode film and of the concentration gradient within it.

SPOT TEST FOR THICKNESS OF CHROMIUM COATINGS

Chromium coatings over nickel deposits on such articles as automobile parts and plumbing fixtures are too thin (about 0.00002 in.) to be measured by customary methods. The spot test is usually used, in which a measurement is made of the time required for one drop of concentrated hydrochloric acid to dissolve the coating. This method, with temperature corrections, is now prescribed in tentative specifications adopted by the American Electroplaters' Society and the American Society for Testing Materials.

W. Blum and W. A. Olson, in a paper prepared for the Proceedings of the American Electroplaters' Society, show that it is necessary to control closely not only the temperature but also the concentration of the hydrochloric acid. The use of 11.2 *N* HCl having a specific gravity at 60°/60°F of 1.180 is recommended, and a temperature-correction curve for that strength of acid has been plotted. With these precautions, the results are accurate to about 10 percent.

WHITEWARE CLAY AND BODY LENGTH CHANGES

The tortoise and the hare have the counterpart of their famous race in pottery bodies. It has been noticed that some pottery shrinks more during a 9-hr trip through the kiln than it does during a 24-hr trip over the same temperature track. Careful measurements by R. F. Geller and E. N. Bunting showed that the bodies investigated are always ahead in shrinkage during the early stages of the heating on the longer schedule. As the maximum temperature is approached, the various ingredients in the body heated on the longer schedule, having had more time to react, produce a stiffer glass bond, which retards shrinkage. The specimens on the short schedule, however, continue to shrink rapidly and forge ahead. When the pottery is cooled and removed from the kiln, it is found that is has shrunk slightly more on the shorter schedule.

The race described takes place during four stages of length change which distinctly mark the behavior of individual clays during initial heating, but which may be masked in a body by such other ingredients as silica and feldspar. The first stage is an expansion to about 500° C, common to both clays and bodies and amounts to about 0.5 percent. The second stage, from about 500° to 900° C, may be either a slight expansion, or a contraction of as much as 3 percent. In clays, the extent and nature of the change in this stage is determined largely by the amount of mica present. The third stage, taking place between 900° and 1,000° C, is always a contraction and varies in amount from 0.6 to 2.7 percent for the clays and seems to be determined by the amount of alumina present from the kaolinite. The fourth stage, during which the shrinkage of the body on the shorter schedule may forge ahead, is a very rapid contraction in both clays and bodies. It begins at

about 1,050° or 1,100° C and varies from about 3 percent for a body to 12 percent for a secondary kaolin. The amount may change somewhat for any one body or clay, depending on the rate of temperature rise and on the particle size distribution in the clay or body.

The complete report of this work will be published as RP1311 in the July number of the Journal of Research.

NATURE OF THE GLASS PHASE IN HEATED CLAY MATERIALS

The two outstanding properties of clay are plasticity when wetted, and hardness and durability when heated. The heat treatment results in fusion of a portion of the minerals present in the clay to form a glassy bond. Since this glass phase cannot be mechanically separated from the unfused portion of the clay mass, it has not been thoroughly investigated.

In studies being conducted by George R. Shelton, synthetic glasses, with compositions limited to three or four oxides, have been prepared. The oxide systems chosen for study include common minerals and in some cases dehydration products of hydrated minerals. For example, the potash-alumina-silica system, in which the preparation of 48 glasses has been completed, contains the following common minerals found in many ceramic raw or heated materials: Orthoclase feldspar, leucite, kaliophilite, trifymite, cristobalite, quartz, corundum, mullite and the dehydate products of kaolinite, muscovite, pyrophyllite, gibbsite, and diaspore. Since emphasis is placed on the glassy products in heated mixtures of a great variety of minerals, the data may be applied to many ceramic products, such as refractories, whiteware, glass, and heavy clay products.

Feldspars, either present in ceramic raw materials or purposely added to raw mixtures, promote the formation of glass in the heated mass. However, feldspars contain a variety of minerals, a pure crystal of feldspar being very rare. In the report entitled "Effect of Rate of Heating on the Glass Phase," by George R. Shelton and William W. Meyer, published in the Journal of the American Ceramic Society **21**, 371 (1938), the feldspar used contained as fluxing oxides, potash, soda, lime, magnesia, and iron oxide, in the order of decreasing amounts. The main constituents of the feldspar were potash feldspar, quartz, small amounts of soda, and less lime feldspar. The impossibility of interpretation of data obtained on glasses of complex composition necessitates the preparation of simple glasses, the above oxides being used to form systems with alumina and silica. The order of investigating these systems is as follows: Potash-alumina-silica; lime-alumina-silica, in which a few glasses have been prepared and tested; potash-lime-alumina-silica, in which more than 100 glasses have been made and tested; soda-alumina-silica, soda-lime-alumina-silica; and magnesia and iron substituted for lime in some of these systems.

DENTAL SILICATE CEMENT

About 20 percent of all dental fillings are silicate cement, which is made by mixing a complex aluminosilicate powder containing calcium, sodium, fluorides, and phosphates with an aqueous solution of phosphoric acid containing zinc and aluminum salts. Results of an investigation conducted by the research associates of the American Dental Association at the Bureau on the physical and chemical properties of dental silicate cements, together with a specification, were published in the January 1938 issue of the Journal of the American Dental Association. In order to assist in transferring these laboratory findings to dental practice, a series of 14 experiments was performed by a group of 115 dentists who were selected by the Research Commission of the Association. These experiments were designed to demonstrate the chemical and physical behavior of different brands of cement and the effect of technic of manipulation upon the serviceableness of the cements. A report of this investigation, which will appear in an early number of the Journal of the American Dental Association, presents the findings of the cooperating group of dentists on seven currently used brands of cement. The trade-brand names of the cement are given throughout the report.

VOLUMETERS FOR MEASURING FLUIDS

The Special Research Committee on Fluid Meters of the American Society of Mechanical Engineers is sponsoring a research program on volumeters with the cooperation of the University of Oklahoma, the Bureau, the meter manufacturers, and groups of interested users. Meters for measuring oil are receiving attention at present, but similar studies will be made of meters for other fluids, both gas and liquid. Most of the tests for meter accuracy will be made at the University of Oklahoma, where special equipment is available. During the course of this program, reports of the results will be published from time to time. A paper giving an outline of the program and describing

the different types of meters being used was presented before the Petroleum Metering Conference at the University of Oklahoma on April 10 and 11 and will be published in forthcoming numbers of Mechanical Engineering and Oil and Gas Journal.

A VACUUM-TUBE ALTERNATING-VOLTAGE COMPENSATOR

One of the methods now being used at the Bureau for the absolute measurement of electrical resistance requires that cyclic fluctuations in a direct current of 1 ampere through a standard resistor should not exceed 1 part in a million of the average value of the current over successive time intervals of a few hundredths of a second. However, in the same circuit there are rapid variations of resistances and voltages of sufficient magnitude to disturb the constancy of the current unless their effects are nullified. For the most part these disturbances are repeated approximately 45 times per second. They are, therefore, effectively an alternating electromotive force superimposed on the electromotive force of the battery in the circuit. In order to keep the direct current constant, the fluctuating voltage was partially compensated by vacuum-tube amplifiers and the effect of the remaining part was reduced by means of an iron-cored inductor.

The amplifier used as an alternating-voltage compensator is adjusted very nearly to a 1 to 1 voltage amplification, so that any input fluctuating voltage of maximum value not exceeding 0.1 volt will produce a nearly similar fluctuating potential drop across the output resistor. This output voltage is approximately equal in magnitude and opposite in phase to the input voltage, so that it is possible to use the output voltage to compensate the effects of the input voltage. The lack of compensation was found to be approximately 5 percent if one amplifier was used, but if two amplifiers were used, connected in cascade, the final lack of compensation was 0.25 percent. Using two of these amplifiers in conjunction with an iron-cored inductor, it was found that the alternating component of the current in the resistor was less than one part in a million of the direct current.

The complete report of this work will be published in the Journal of Research for July as RP1312, by I. L. Cooter, F. Wenner, and C. Peterson.

DUAL BRIDGE FOR MEASUREMENT OF INDUCTANCE

The measurement of self inductance has become of increasing importance during the last quarter of a century. At the beginning of that period, a practicing electrical engineer was not ashamed to say that while he had heard of self inductance when in college, he had almost forgotten about it as he had never found need of it in practice. Today, an electrical engineer, whether he be engaged in the transmission of power, in communication by wires, or in broadcasting through the ether, makes frequent use of his knowledge of self inductance.

The self inductance of a circuit must, in practical work, be correlated with the resistance of this circuit. Hence it is important to be able to make measurements or resistance and inductance in related units. Heretofore the most usual method of measuring an inductance in terms of resistance and time has required two separate measurements, in each of which a capacitance was employed. The dual bridge method compares a self inductance directly with resistance and time. In the July Journal of Research (RP1310), Harvey L. Curtis and L. W. Hartman give experimental results to show that good accuracy can be obtained by this method.

ESTIMATION OF ASH IN TEXTILE FIBERS

The ash of textile fibers is of considerable practical interest. For example, the electrical properties of cotton, silk, and wool depend upon the nature and amount of inorganic substances in the fibers. In addition, this ash content influences the uptake of moisture and dyestuffs, as well as the ability of the fiber to combine with certain softening or finishing agents.

The results of the combustion method for estimating ash acquire significance in terms of equivalents only when an estimate of the composition of the ash can be made. Since the ash may contain substances, such as sulfate in the case of wool, which are not in the unburned fiber, but which are formed during the combustion process, its composition is uncertain at best.

Recent work of the research associates of the Textile Foundation at the Bureau has shown that the hydrogen-ion equivalence of the cationic ash of fibers (the total content of the cations of bases whether free, or combined with acids, or with the acid groups of the fibers) may be obtained directly, without ignition, by existing electrodialytic procedures, hitherto applied principally to biological solutions. Only simple and inexpensive equipment is required. The content of any given

anion in the sample may be similarly determined. By duplicating the procedure on a larger scale, the method has been used to obtain samples of fibrous materials of very low ash content. A simple extension of the method which permits the quantitative determination of the acidic and basic groups in the material consists in combining them with suitable tightly bound cations or anions which are subsequently estimated by the electrodialytic procedure.

In RP1314 by Arnold M. Sookne, Charles H. Fugitt, and Jacinto Steinhardt, which will be published in the July Journal of Research, examples are given of the application of the method to dewaxed and to depectinized cotton. In both cases the results are shown to correspond with the capacity of the fibers to bind acid. Examples are given of ash determinations on wool fibers and on samples of wool cloth at several stages in processing subsequent to the carbonizing processes. A comparison of the results with the ash obtained gravimetrically on similar samples, after combustion, permits the estimation of the average equivalent weight of the constituents of the ash, and aids in their identification. It is shown that the largest part of the ash of untreated wool, as obtained by combustion, consists of sulfates. Since sulfates are not present to an appreciable extent in washed (defatted) root-wool fibers, the presence of this anion in the ash of such fibers must be attributed to the oxidation of the sulfur of the wool during combustion. The much larger ash remaining after carbonizing, neutralizing, and rinsing is also in the form of sulfates, but at these stages most of the sulfate has been contributed by the sulfuric acid in the carbonizing process.

ACIDIC PROPERTIES OF COTTON

Cellulosic materials exhibit acidic properties which influence many of their physical and chemical characteristics. Thus the acidic groups of the fiber bind small amounts of ash which have an effect on the electrical conductivity of cotton fibers, and on the viscosities of solutions of some cellulose derivatives. The ash may also affect the dyeing properties of the fiber, and may be related to the application of finishing agents. Since the ash of washed cotton consists principally of cations held by acidic groups, the problems of measuring the ash and the number of acidic groups on the fiber are intimately related. In addition, if some of the acidic groups of purified cotton are a part of the cellulose molecule, such as end-groups, the number of these groups may be a measure of its chain length, which is of primary importance in determining the strength and other physical characteristics of the fiber.

As part of the investigation of the acidic and basic properties of textile fibers, Arnold M. Sookne and Milton Harris, research associates of the Textile Foundation, have studied the manner in which hydrochloric acid is bound by cotton, and the dependence of the amount of acid bound on the concentration of the acid solution in contact with the fiber. The effect on this dependence of different amounts of an added neutral salt, potassium chloride, has also been studied.

A comparison of the acid bound with the cationic ash (the total content of the cations of inorganic bases), as determined by an electrodialysis method, leads to the conclusion that the *maximum* acid-binding capacity is equivalent to the cationic ash, and that, therefore, the acid bound at any acidity depends upon the ash. A comparison of the results for dewaxed cotton with those for depectinized cotton shows that most of the acidic groups of cotton are contributed by the pectic substance.

Cotton freed of pectic substance retains a small number of acidic groups. Although other possibilities exist, it seems likely that these are an integral part of the cellulose molecule, such as an end-group. If this is actually the case, the results show that the cotton cellulose molecule has an equivalent weight of about 100,000, which corresponds to a minimum chain length of about 600 glucose residues.

RP1313 in the Journal of Research for July should be consulted for a complete account of this work.

STABILITY OF FIBER BUILDING BOARDS

The relative lasting qualities of fiber insulating boards have been studied as part of the investigation of materials for low-cost houses. Accelerated-aging tests were used to produce effects similar to those arising from long periods of service.

Samples of the boards were subjected to wetting, drying, freezing, and baking in relatively rapid succession, and this treatment was supplemented by outdoor exposures made drastic by frequent wetting. Conclusions as to stability were based on relative resistance to the aging treatments and to the action or rot-producing fungi. In general, the retention under the aging treatments of the most essential properties of the boards—thermal conductivity and strength—was excellent.

Furthermore, the fiber boards did not support the growth of rot-producing fungi except at relative humidities above 85 percent. The growth at higher humidities was prevented, or at least appreciably retarded, by impregnating the boards with fungicides. The tests indicate, however, that these boards are not suitable for the exterior covering of buildings.

Results are given in detail in Building Materials and Structures Report BMS50, obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents a copy.

AMERICAN LUMBER STANDARDS

Simplified Practice Recommendation R16–39, Lumber, which was approved by the industry for promulgation October 15, 1939, is now available in printed form. This recommendation, which is also known as American Lumber Standards, constitutes the classifications, nomenclature, grading provisions, sizes, workings, description, measurement, tally, shipping, grade marking, and inspection provisions adopted by the lumber industry as the basis for individual grading rules covering the various species of softwood lumber.

In this fourth revision of R16, the basic provisions are in general strengthened and clarified, those governing the selection and inspection of softwood lumber stress-grades are thoroughly revised in accordance with up-to-date information on the effect of quality on the strength of lumber, and the sections on shingles and mouldings, published separately since 1933, are added in their proper place. A brief history of the recommendation's development, a list of membership of the Central Committee on Lumber Standards, and a list of acceptors of the recommendation are also included.

Copies of R16–39 are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is 20 cents.

AIR INFILTRATION THROUGH WINDOWS

The infiltration of cold air to the interior of a building through the clearance openings around movable members of windows and doors under the action of the wind may be an important factor in determining heating-load requirements. Equipment for measuring the volume of infiltered air has been developed by Eugene F. Coleman and Roy H. Heald as a part of the investigation of materials and structures suitable for low-cost housing. Building Materials and Structures Report BMS45, which has just been released, describes the equipment and method used in making the infiltration measurements, and presents the results obtained for two types of windows frequently specified for low-cost construction. Copies are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

CARBON PAPER AND TYPEWRITER RIBBONS

Many persons ask the Bureau how to manufacture carbon paper and typewriter ribbons, evidently thinking that it must be easy to stir together the ingredients of the coating on carbon paper or of the ink in a ribbon, and to spread the mixture uniformly and in the right amount on the paper or fabric. Neither the mixing of the ingredients nor the spreading of the composition is a simple matter. Both operations require skill gained by experience, and machines adapted to the requirements of the task. Making carbon paper or typewriter ribbons is not a profitable operation for spare moments at home. Nevertheless, this Bureau has no desire to withhold information, and has written Letter Circular LC597, in which some formulas are given. Copies will be sent on request to those having a real need for the information.

Some of the letters received ask about testing carbon paper and typewriter ribbons. LC597 describes the test methods of the Federal specifications, and also shows how the more important tests can be made by anyone on an ordinary typewriter.

ERRORS IN JUNE TECHNICAL NEWS BULLETIN

Attention is directed to the following errors in Technical News Bulletin 278 (June 1940): Page 51, "Moisture relations of textile fibers at elevated temperatures." The last value given in this item should read "220° F." instead of "200° F." Page 52, first column, third paragraph, should start "When a steady flow * * *." Page 54, "LC490" should read "LC590."

NEW AND REVISED PUBLICATIONS ISSUED DURING JUNE 1940

Journal of Research [2]

Journal of Research of the National Bureau of Standards, volume 24, number 6, June 1940 (RP1302 to RP1309, inclusive). Price 30 cents. Annual subscription, 12 issues, $3.50.

See footnote on next page.

Research Papers[2]

[Reprints from the March and April 1940 Journal of Research]

RP1283. Measurement, in roentgens, of the gamma radiation from radium by the free-air ionization chamber. Lauriston S. Taylor and George Singer. Price 5 cents.

RP1293. Outdoor exposure tests of electroplated nickel and chromium coatings on steel and nonferrous metals. William Blum and P. W. C. Strausser. Price 5 cents.

Building Materials and Structures Reports[2]

[Persons who wish to be notified of new publications in the Building Materials and Structures series as soon as they are available, should write to the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., asking that their names be placed on the special mailing list maintained by him for this purpose.]

BMS45. Air infiltration through windows. Eugene F. Coleman and Roy H. Heald. Price 10 cents.

BMS50. Stability of fiber building boards as determined by accelerated aging. Daniel A. Jessup, Charles G. Weber, and Samuel G. Weissberg. Price 10 cents.

Simplified Practice Recommendations[2]

R16–39. Lumber: American lumber standards for softwood lumber. (Supersedes R16–29 and Supplement.) Price 20 cents.

R174–40. Large-tube cast-iron radiators. Price 5 cents.

Commercial Standards[2]

CS77–40. Sanitary cast-iron enameled ware. Price 5 cents.

Technical News Bulletin[2]

Technical News Bulletin No. 278, June 1940. Price 5 cents. Annual subscription, 50 cents.

[2] Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, $3.50 (to addresses in the United States and its possessions, and in countries extending the franking privilege); other countries, 70 cents and $4.50, respectively.

MIMEOGRAPHED MATERIAL

Letter Circulars

[Letter Circulars are prepared to answer specific inquiries addressed to the National Bureau of Standards and are sent only on request to persons having definite need for the information. The Bureau cannot undertake to supply lists or complete sets of Letter Circulars or send copies automatically as issued.]

LC595. Engineering mechanics: Publications by members of the staff of the National Bureau of Standards. (Supersedes LC316.)

RECENT BUREAU ARTICLES APPEARING IN OUTSIDE PUBLICATIONS[3]

Annual summary of progress on radio wave propagation. J. H. Dellinger. Proc. Inst. Radio Engineers (33 West 39th St., New York, N. Y.) 28, 108 (March 1940).

American Dental Association Specification No. 3 for dental impression compounds. First revision—1939. W. T. Sweeney and John R. Beall. J. Am. Dental Assn. (212 East Superior St., Chicago, Ill.) 27, 715 (May 1940).

Melting points of the *p*-bromoanalides of solid fatty acids. David F. Houston. J. Am. Chem. Soc. (12 Oxford St., Cambridge, Mass.) 62, 1303 (May 1940).

Pectic substance in cotton and its relation to the properties of the fiber. Roy L. Whistler, Albert R. Martin, and Milton Harris. Textile Research (65 Franklin St., Boston, Mass.) 10, 269 (May 1940) and Am. Dyestuff Reporter (90 William St., New York, N. Y.) 29, 244 May 1940).

Pure irons—ancient and modern. J. G. Thompson. Mining and Metallurgy (29 West 39th St., New York, N. Y.) 21, 231 (May 1940).

Why have standards for burning equipment? Iler J. Fairchild. Trans. Third Annual Anthracite Confer. of Lehigh University (Bethlehem, Pa.) 229 (May 9-10, 1940).

Uncle Sam helps the housewife. Lyman J. Briggs. The Retail Executive (3 East 13th St., New York, N. Y.) 12, No. 21, 16 (May 22, 1940).

[3] These publications are not obtainable from the Government. Requests should be sent direct to the publishers.

U. S. GOVERNMENT PRINTING OFFICE: 1940